Note on the Nebulous Star in Mr. Roberts's Photograph of 81 and 82 Messier. By Herbert Ingall.

At the April meeting of the Society some discussion ensued on the so-called nebulous star in this photograph, and the idea appeared to be put forth that it was either new or was *really* the nebula—mentioned by Sir William Herschel near 81 M., but queried in the Gen. Cat. as probably a mistaken entry of 81 M., and omitted in the new Gen. Cat. of Dreyer as certainly an error. As I have not heard of any further views on the subject I thought it might be well to try and identify the nebula. It is Gen. Cat. No. 1982 (=286 H I), and there described as "cB; cL; mbM; R. with ray." In the "Notes on Nebulæ" that I have contributed from time to time to the *Eng. Mech.*, I find that I observed it November 28, 1875, as "a moderately bright diffused nebula, 4′ *s.f.*, a bright 7 mag. star, round," and brightening to a rather condensed nucleus, but scarcely stellar; and on November 30 I say, "Dark night, nebula as above." I could detect no "ray" as mentioned by Herschel, and in a recent glance in a twilight sky the object was very diffuse and rather faint.

The extraordinary difference of its appearance in the photo-print (I have not seen the negative), and in the telescope is worthy of remark. In the latter the bright starlike aspect is entirely wanting, and it will be observed that the observations generally agree as to its aspect to the eye. D'Arrest says, October 9, 1862, only "much brighter round the middle," and again, August 12, 1866, "Subrotunda cum nucleo satis delicato ✱ 11," but whether he means a star, or equal to 11 mag. ✱, is not quite clear to me.

The place of Sir William Herschel's doubtful nebula would be near the centre of the photograph, where certainly there is no trace of nebula now.

On the Orbit of Sirius. By J. E. Gore.

The components of this interesting binary are now approaching their minimum distance, and the companion is rapidly becoming a very difficult object to measure, even with the largest telescopes. Using all the measures I could obtain from the date of its discovery by Alvan Clark, early in 1862, down to a measure made by Mr. Burnham with the Lick refractor at the close of last year, I have computed the orbit by the following method:—

Having plotted all the observations (corrected for precession to 1880·0) and drawn the interpolating curve, and the apparent ellipse in the usual way, I computed, by Professor Glasenapp's

method (*Monthly Notices*, March 1889), the values of the coefficients in the general equation of the second degree—

$$\alpha x+\beta y+\gamma x^2+\delta xy+\epsilon y^2+1=0,$$

and obtained the following results:—

$$\alpha=-0{\cdot}001486$$
$$\beta=+0{\cdot}0067904$$
$$\gamma=-0{\cdot}00009408$$
$$\delta=+0{\cdot}0000827$$
$$\epsilon=-0{\cdot}0000677$$

These values were then substituted in Kowalsky's equations:—

$$\frac{\tan^2 i}{q^2}.\sin 2\Omega=\delta-\tfrac{1}{2}\alpha\beta$$

$$\frac{\tan^2 i}{q^2}.\cos 2\Omega=(\gamma-\epsilon)-\tfrac{1}{4}(\alpha^2-\beta^2).$$

$$\frac{2}{q^2}+\frac{\tan^2 i}{q^2}=-(\gamma+\epsilon)+\tfrac{1}{4}(\alpha^2+\beta^2).$$

$$e\sin\lambda=-\frac{q}{2}(\beta\cos\Omega-\alpha\sin\Omega)\cos i.$$

$$e\cos\lambda=-\frac{q}{2}(\beta\sin\Omega+\alpha\cos\Omega).$$

$$a=\frac{q}{1-e^2}.$$

From these the geometrical elements of the orbit were computed. The values of P and T were obtained by another method.

The following are the resulting elements, which must be considered as provisional until further measures are available:—

Elements of Sirius.

$P=58{\cdot}47$ years	$\Omega=49^\circ\ 59'$ (1880·0)
$T=1896{\cdot}47$	$\lambda=216^\circ\ 18'$
$e=0{\cdot}4055$	$a=8''{\cdot}58$
$i=55^\circ\ 23'$	$\mu=-6^\circ{\cdot}156$

Assuming Gyldén's parallax for *Sirius*, $0''{\cdot}193$, the above values of P and a give

Sum of masses = 26·298 (Sun's mass = 1)

Mean distance = 44·45 (Earth's mean distance from Sun = 1)

The following is a comparison between the recorded measures and the positions computed from the above elements. The

observed position-angles have been corrected for the effect of precession to 1880·0.

Epoch.	Observer.	θ_o	θ_c	$\theta_o-\theta_c$	ρ_o	ρ_c	$\rho_o-\rho_c$
1862·08	A. Clark	85° ±	85·23°	...	10"	9·03"	+0·97"
1862·19	Bond	84·7	84·93	−0·23	10·07	9·07	+1·00
1862·2	Rutherford	85·1	84·90	+0·20	...	...	...
1862·2	Chacornac	84·7	84·90	−0·20	...	...	...
1862·23	Challis	85·1	84·82	+0·28	10·42	9·08	+1·34
1862·28	Lassell	84·0	84·68	−0·68	...	...	...
1863·08	Mitchell	78·6	82·47	−3·87	10·5	9·38	+1·12
1863·10	Rutherford	81·3	82·42	−1·12	...	9·38	...
1863·14	Marth	79·4	82·31	−2·91	10·60	9·39	+1·21
1863·15	Mitchell	79·7	82·29	−2·59	10·9	9·39	+1·51
1863·20	,,	79·3	82·16	−2·86	10·40	9·41	+0·99
1863·21	O. Struve	82·6	82·13	+0·47	10·14	9·41	+0·73
1863·23	Dawes	84·91	82·08	+2·83	10·0	9·42	+0·58
1863·24	Winnecke	79·8	82·06	−2·26	...	9·42	...
1863·27	Bond	82·9	81·98	+0·92	...	9·42	...
1864·15	Lassell	80·4	79·70	+0·70	9·53	9·70	−0·17
1864·21	,,	80·2	79·57	+0·63	9·67	9·72	−0·05
1864·22	O. Struve	79·6	79·54	+0·06	10·92	9·72	+1·20
1865·20	,,	77·3	77·32	−0·02	10·60	10·02	+0·58
1865·22	Forster	78·0	77·27	+0·73	10·78	10·02	+0·76
1865·24	Struve	73·8	77·22	−3·42	10·79	10·02	+0·77
1865·25	Tietjen	76·9	77·19	−0·29	...	10·03	...
1865·26	Engelmann	77·0	77·16	−0·16	9·0	10·03	−1·03
1865·26	Bond	76·1	77·16	−0·06	9·0	10·03	−1·03
1865·70	Struve	73·38	76·0	−2·62	12·91	10·13	(+2·78)
1866·08	Knott	77·18	75·14	+2·04	10·43	10·25	+0·18
1866·20	Tietjen	76·88	74·87	+2·01	10·97	10·28	+0·69
1866·20	Bruhns	...	74·87	...	10·74	10·28	+0·46
1866·20	O. Struve	75·28	74·87	+0·41	10·93	10·28	+0·65
1866·23	Wash. Obs.	74·38	74·81	−0·43	10·21	10·28	−0·07
1866·25	,,	74·38	74·77	−0·39	10·65	10·27	+0·38
1867·22	O. Struve	72·17	72·71	−0·54	10·98	10·52	+0·46
1867·24	Forster	72·37	72·67	−0·30	...	10·52	...
1868·24	Bruhns	69·57	70·54	−0·97	11·35	10·70	+0·65
1868·26	Engelmann	71·67	70·50	+1·17	10·95	10·70	+0·25
1869·10	Brünnow	74·76	68·81	(+5·95)	11·26	10·88	+0·38
1869·15	Vogel	73·66	68·72	(+4·94)	11·23	10·88	+0·35

Epoch.	Observer.	θ_o	θ_c	$\theta_o-\theta_c$	ρ_o	ρ_c	$\rho_o-\rho_c$
1869·20	Dunér	68°·76	68°·62	+0°·14	11″·17	10″·89	+0·28
1871·22	,,	64·15	64·71	−0·56	10·92	11·15	−0·23
1871·25	Pechule	60·15	64·64	(−4·49)	12·10	11·15	+0·95
1872·18	Dunér	59·84	62·56	−2·72	11·0	11·24	−0·24
1872·24	Wash. Obs.	62·74	62·43	+0·31	11·55	11·24	+0·31
1873·22	Dunér	60·84	60·97	−0·13	10·57	11·27	−0·70
1874·14	Wash. Obs.	58·03	59·27	−1·24	11·39	11·26	+0·13
1875·19	Dunér	57·13	57·32	−0·19	10·73	11·21	−0·48
1875·23	Wash. Obs.	56·23	57·24	−1·01	11·47	11·21	+0·26
1877·17	,,	52·81	53·55	−0·74	11·35	11·00	+0·35
1877·25	,,	53·41	53·40	+0·01	10·95	10·98	−0·03
1877·93	Burnham	53·21	52·06	+1·15	10·71	10·83	−0·12
1877·97	,,	52·41	51·98	+0·43	10·83	10·82	+0·01
1878·03	,,	51·11	51·86	−0·75	...	10·81	...
1879·05	,,	50·7	49·77	+0·93	10·44	10·62	−0·18
1879·75	Cinn. Obs.	46·5	48·30	−1·8	10·29	10·44	−0·15
1880·11	Burnham	48·3	47·42	+0·88	10·00	10·27	−0·27
1880·168	Hough	49·6	47·29	+2·31	9·87	10·26	−0·39
1881·07	Burnham	46·3	45·32	+0·98	9·77	10·01	−0·24
1881·12	Holden	43·3	45·20	−1·90	10·83	9·99	+0·84
1881·26	Wash. Obs.	45·3	44·86	+0·44	10·0	9·94	+0·06
1881·26	Hough	45·3	44·86	+0·44	9·60	9·94	−0·34
1881·99	Burnham	43·6	43·09	+0·51	9·38	9·67	−0·29
1882·127	Hough	43·1	42·75	+0·35	9·30	9·61	−0·31
1882·183	Frisby	42·24	42·61	−0·37	9·955	9·58	+0·375
1882·235	Hall	42·48	42·48	0·0	9·668	9·57	+0·098
1883·10	Young	38·99	40·67	−1·68	9·41	9·21	+0·20
1883·12	Hough	39·68	40·60	−0·92	9·02	9·20	−0·18
1883·17	Frisby	41·41	40·43	+0·98	9·754	9·17	+0·584
1883·211	Hall	39·08	40·29	−1·21	9·260	9·15	+0·11
1884·05	Hough	35·98	37·37	−1·39	9·67	8·72	+0·95
1884·179	,,	36·68	36·98	−0·30	8·51	8·65	−0·14
1884·19	Burnham	36·38	36·95	−0·57	8·39	8·64	−0·25
1884·226	Hall	37·64	36·83	+0·81	8·81	8·62	+0·19
1884·273	Young	36·28	36·70	−0·42	8·70	8·60	+0·10
1885·11	Paris Obs.	34·07	33·85	+0·22	8·09	8·13	−0·04
1885·112	Young	34·03	33·85	+0·18	8·09	8·13	−0·04
1885·197	Hough	32·67	33·50	−0·83	7·96	8·08	−0·12
1885·268	Hall	34·70	33·25	+0·45	8·057	8·03	+0·027

Epoch.	Observer.	θ_o	θ_c	$\theta_o - \theta_c$	ρ_o	ρ_c	$\rho_o - \rho_c$
		°	°	°	″	″	″
1885·301	Hall	33·87	33·09	+0·78	7·93	8·01	−0·08
1886·047	Young	29·74	30·26	−0·52	7·59	7·57	+0·02
1886·14	Wash. Obs.	30·57	29·90	+0·67	7·21	7·51	−0·30
1886·144	Hough	28·67	29·88	−1·21	7·21	7·51	−0·30
1886·22	Wash. Obs.	28·66	29·53	−0·87	7·39	7·46	−0·07
1887·14	Young	25·36	25·32	+0·04	7·08	6·84	+0·24
1887·195	Hough	23·66	25·04	−1·38	6·78	6·80	−0·02
1887·238	Hall	24·14	24·82	−0·68	6·508	6·77	−0·262
1888·97	Burnham	13·85	13·96	−0·11	5·27	5·52	−0·25

I have computed the following short ephemeris:—

Epoch.	Position-angle.	Distance.
	°	″
1890·2	2·61	4·62
1891·2	349·68	3·95
1892·2	332·27	3·45
1893·2	310·88	3·23
1894·2	288·95	3·36
1895·2	270·37	3·78
1896·2	255·95	4·24

On the close Conjunction of Mars and Saturn near Regulus on September 19, 1889. By A. Marth.

The conjunction of *Mars* and *Saturn* predicted in the Almanacs for September 19, 20^h G.M.T., deserves special attention. The tabular places of the two planets give the nearest geocentric approach of their centres 54″·8 at 20^h 7^m Greenwich mean time, so that the conjunction will be a closer one than that of June 30, 1879, when the shortest distance between the nearest limbs was 74″, according to the Melbourne observations, *Monthly Notices*, vol. xl. p. 30. The next close conjunction preceding that of 1879 took place on April 18, 1817, but was not observable at any then existing observatory, and of any previous close conjunction there is at least no record.

The differences of right ascension and declination between *Titan* and *Iapetus* and the centre of *Saturn* will be

		Titan.		*Iapetus.*	
		$\alpha_6 - A.$	$\delta_6 - D.$	$\alpha_8 - A.$	$\delta_8 - D.$
	h	s	″	s	″
Sept. 19	16 Gr.	−7·81	−34·6	+11·54	−11·7
	20 „	7·25	35·0	11·12	11·5
20	0 „	−6·66	−35·2	+10·70	−11·3